



The Effect of Project-Based Learning with the Science, Technology, and Society Approach on Digestive System Material Against the Concept Mastery

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Abstract: This study aims to examine the effect of a project-based learning model with a science, technology, and society approach to students' mastery of class VIII concepts. This type of research is a quasi-experimental type using a non-equivalent control group design. The population of the study was students of SMP Negeri 7 Mataram for the 2021/2022 academic year with a sample consisting of 74 class VIII students. The data obtained were analyzed using the Covariate Analysis test (anacova) with reference to a significance level of 0.05. The results of the study show that the sig. (p) = 0.000 less than alpha 0.05, so it can be concluded that the project-based learning model with a science and technology community approach has a significant effect on junior high school students' conceptual understanding.

Keywords: Project based; Science-technology-society; Concept mastery

Introduction

Skills in the 21st century are prioritized in the learning process in science subjects (Anil, 2019). The four pillars of education are important in 21st century skills, namely learning to know, learning to do something, learning to be able to live together, and learning to be something. The four pillars hold on to skills that are important to be developed in the learning process, such as skills in higher order thinking, problem solving, metacognition, and other 21st century skills.

Biology learning provides experience to understand process skills and science concepts. The science process skills in question are the skills of asking questions, analyzing data, and presenting findings in writing or orally, seeking and filtering information from reliable sources so that they can solve biological problems that exist in the environment of everyday life (Juliastari et al., 2022).

Based on initial observations that have been made through interviews with science teachers at SMP Negeri 7 Mataram, information is obtained that the learning

methods used daily, especially during the Covid 19 pandemic and limited face-to-face learning, are lecture and discussion methods. When the teacher and students have discussions the results are not optimal because the discussions are more monotonous to the teacher, students are more difficult to control and learning becomes less active. The teacher tries to give students assignments to do at home but the results are still less than expected. Biology learning provides experience to understand process skills and scientific concepts, because learning biology is not only to be memorized but requires mastery of concepts. Mastery of students' concepts when carrying out learning is an ability in students to develop one fact with another fact (Pratiwi et al., 2018). When mastering the concept students must be able to combine the knowledge they have because by mastering the concept of developing the knowledge they have will be wider. Mastery of Biology concepts for students will be easier and more successful if appropriate learning models are applied that can make students seek, try, and understand biology itself.

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The project-based learning model is a learning model that creates innovation in students, where students are required to learn contextually by carrying out more complex activities. This project-based learning relies on projects as learning activities, working on this project will make students more active and able to solve problems in the surrounding environment and make decisions (Susilowati et al., 2013).

The project-based learning model with a science, technology, and society approach was chosen because learning using these models and approaches can involve students in solving more complex and real problems around the student's environment. In addition, by using this learning model and approach students are required to investigate, investigate, make observations, and solve problems while completing projects.

Method

The method in this study is a quasi-experimental study using a non-equivalent control group design. The research location is SMP Negeri 7 Mataram. The population of the study was students of SMP Negeri 7 Mataram for the 2021/2022 academic year with a sample consisting of 74 class VIII students. The research sample was taken using a purposive sampling technique by considering the same study day and studying the same material, namely the topic of the digestive system. The research sample consisted of two classes, namely the control class with 37 students and the experimental class which also consisted of 37 students. The experimental group was given learning using a project-based model with an science, technology, and society approach, while the control group was given conventional learning, namely applying learning using the lecture method and doing practice questions.

The independent variable in this study is the application of different learning models, while the dependent variable is students' mastery of concepts. Research data in the form of mastery of scientific concepts taken from test results. The test used was a multiple-choice test which consisted of 15 test items whose validity was tested with a significance value for each item, namely $p < 0.05$ and was declared reliable as evidenced by the Cronbach alpha value of 0.770. The data is presented descriptively through the presentation of graphs and tables of the results of inferential statistical analysis. The research hypothesis is that there is a significant influence in the application of the project-based learning model with the science, technology, and society approach to students' mastery of scientific concepts. Hypotheses were tested by analysis of covariance (anacova) at an alpha of 0.05. Before carrying out the anacova test, the data is first tested for normality and homogeneity which is a prerequisite test of anacova.

Result and Discussion

The results of the study were obtained from the pretest and posttest scores of students' mastery of the concepts in the experimental class and the control class. The average pretest score for students' mastery of concepts in the experimental class was 28.11, while the average score in the pretest in the control class was 26.24. The post-test results in both the experimental class and the control class experienced an increase from the pre-test results obtained, but the experimental class saw a higher visible increase than the control class. The standard deviation (SD) data and the average score of the pretest and posttest scores of the two classes are presented in Table 1.

Table 1. Average and SD of Pretest and Posttest Mastery of Scientific Concepts from Students

Class	Pretest		Posttest	
	Average	SD	Average	SD
Control	26.24	13.22	34.49	22.26
Experiment	28.11	14.45	55.00	8.3

Table 2. Anacova Test Results

Source of Variation	Sum of Squares Type III	Free Degrees (db)	Squared Mean	F	Sig.
Learning model	7251.362	1	7251.362	28.027	0.000

The results of testing for normality and homogeneity of variance from the pre-test and post-test data of the experimental and control classes show that the data is normally distributed and has a homogeneous variance. The normality test results used the Kolmogorof Smirnov test which showed significance in the pre-test and post-test (sig. > 0.05) and the results of the Levine test homogeneity test also showed a value (sig. > 0.05).

The results of the hypothesis test are based on the results of the anacova test. Based on the results of the anacova test, a significance value (p) = 0.000 was obtained, indicating a significance value smaller than alpha 0.05. The results of this test lead to the rejection of H_0 and acceptance of H_a which indicates a significant influence on the application of the project-based learning model with the science, technology, and society approach to students' mastery of scientific concepts at SMP Negeri 7 Mataram.

Based on the average pretest and posttest scores, the control class and the experimental class showed an increase in mastery of science concepts in the experimental class was higher than in the control class. This was because the experimental class applied a project-based learning model with a science, technology, and society approach. The increase in students' mastery of concepts that have been given treatment using a project-based learning model is in line with research that

has been carried out by Yance et al. (2013) says that students' mastery of concepts increases after being given treatment using a project-based learning model. Mastery of student concepts is not only the process of remembering but students are encouraged to apply the concepts that have been obtained to solve existing problems. Mulyani (2014) said students would solve problems more quickly when these students mastered the concepts in an object.

Project-based learning requires students to apply the concepts they have learned and master their knowledge. Based on the analysis of the data that has been obtained through hypothesis testing using the anacova test presented in table 2, a significance value of 0.000 or smaller with 0.05 is obtained, which means that there is a significant influence between the use of project-based learning models and the science, technology, and society approach on students' mastery of concepts. The results of this study are reinforced by research conducted by Hanifah et al. (2019), and Siregar et al. (2015) which say that students' understanding of concepts increases when given treatment using a project-based learning model. Students are led to think more complexly and understand and know the lessons they have learned so they can integrate them in real life, are able to utilize technology as a source of learning and are able to solve problems well.

Project-based learning helps students to understand in depth the content of learning and assists students in explaining and applying the knowledge concepts acquired (Martin et al., 2005) so that students are able to design a project when given the task of making a project to solve a problem in society (Wena, 2009). Assignments given in the form of projects stimulate all five senses of students to complete assignments and solve problems in the surrounding environment, so that students will become more active in solving these tasks and problems. Wahyuni (2020), Smarabawa et al. (2013), and Novitasari et al. (2020) who say that there is an increase in students' critical thinking skills and self-regulation of students, if implementing project-based learning with the science, technology, and society approach. Project-based learning is also able to develop the potential of students in terms of social, emotional, physical, intellectual, and moral abilities which really need to be developed (Ramadiyanti et al., 2016). While Maemunah et al. (2013) from the results of their research concluded that there was a significant difference in increasing the creativity of students who applied the science, technology, and society model during learning and did not apply the science, technology, and society model during learning Agustini et al. (2013), Suarni et al. (2021), Fauziah et al. (2021) and Afni et al. (2017) from the results of their research said that students' mastery of physics concepts taught by the science, technology, and society model was higher than

students' mastery of physics concepts taught using conventional methods. On the other hand, Amalini et al. (2021) says learning by using science, technology, and society learning for science process skills can significantly improve learning outcomes, activities and student responses.

Conclusion

The results of this study can be concluded that the project-based learning model with a science, technology, and society approach has a significant effect on students' understanding of concepts at SMP Negeri 7 Mataram. Based on these findings, it is suggested that further research be conducted regarding the use of project-based learning models with a science, technology, and society approach with other materials which optimize laboratory use in order to obtain more studies.

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